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A study of literature on creativity is presented. Creativity demands an awareness of problems, ability to concentrate on these problems, ability to tolerate, perhaps welcome, the tension of an unsolved problem. Creative people can be young; and they are able to work in a free situation. They are self-starting, with high intellectual ability. Their mental health has been described as rugged in terms of frustration tolerance, but with a distaste for interpersonal relations.

There may be an organic basis to creativity to some considerable extent, though training in problem solving and brainstorming seems to be of some help. Better solutions to problems seem to emerge when there is relatively little pressure. The process of problem solving is outlined as preparation, incubation, illumination or insight, and verification. The school can have an active role only in the first and last steps, and provide a favorable environment for the middle two stages.

General summaries are given of literature concerning description and criteria of creativity, characteristics and age range of creators, research on cultivation of creativity. In each case specific studies are cited. Development of creativity should be considered as the end objective of educational programs for the gifted. Creativity and the fostering of it influence content of curriculum, grouping, instructional methodology, and administrative procedures.

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GUIDANCE DEPARTMENT

April 20, 1961

A STUDY OF LITERATURE ON CREATIVITY

A REPORT

TO

THE SUBCOMMITTEE ON THE PROGRAMS FOR
GIFTED CHILDREN

Richard J. Burnett
Scott C. Gray

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CREATIVITY

I. INTRODUCTION

Analysis of the materials in the literature suggests certain points of convergence of opinion in research as well as in informed speculation.

The whole problem of definition of creativity is an extremely difficult and complex one. Creativity demands an awareness of problems, ability to concentrate on these problems, an ability to tolerate, perhaps welcome, the tension of an unsolved problem. Creativity cannot be based solely on past knowledge since it may well be and perhaps needs to be a new dimension of meaning which transcends the limitations of the past. On the other hand it is necessary to recognize that divergence of thought or behavior is not necessarily creative. For an extreme example, the psychotic person may show extreme divergence but no creativity in any constructive sense.

Studies suggest that creative people have been young and able to work in a free situation where value was placed on the work they did. Their intellectual abilities have been very high. They are self-starting. Their mental health has been described as rugged in terms of frustration tolerance, but with a distaste for interpersonal relations. They are not back-slappers. They may not match the ordinary concepts of "good adjustment."

It appears that there may be an organic basis to creativity to some considerable extent. Training in problem-solving methods, including brain-storming, seems to have been of some help. However, the literature suggests that the native ability needs must have been there first. Better solutions to problems seem to emerge when there is relatively little pressure. Pressures of routine classwork, routine homework, etc., may well prevent emergence of creative thought.

The school, in determing its role in fostering creativity, might well follow the classic outline of the process of problem-solving as follows:

(1) Preparation
(2) Incubation
(3) Illumination or insight
(4) Verification

Clearly the school can furnish information, equipment and assistance in the preparation stage. Without preparation the creative person might either be unable to perceive genuine problems, or might spend a great deal of time in creative solutions of problems which were solved years, even centuries, ago.

The stages of incubation and illumination may well be determined organically or consitutionally, but in the opinion of many will not take place unless there is a favorable environment. This favorable environment should be a leisurely and non-critical one where creative and even idiosyncratic ideas can develop without external pressures. We must remember that pressures tend to reduce production of creative ideas. At the same time, value must be placed on creativity by the environment. The creative person is described over and over as a self-starter. Perhaps the school may be comfortable in reducing pressures on him on this account with the full confidence that he will be a self-starter.

Certainly in the area of verification, the school again has an important role. Verification consists of the application of knowledge and techniques which can and must be learned.

In general, if one follows the above formulation, it becomes increasingly clear that the schools' contributions can best be applied in a setting where creativity is valued, where much special equipment is available, where pressures are minimized, and where capable and sympathetic teachers have a free hand in fanning

the creative spark. All this seems to suggest something other than the traditional school facilities and procedures for these purposes.

Much further detailed documentation from the literature follows in the subsequent sections of this paper.

II. DESCRIPTION AND CRITERIA OF CREATIVITY

A. General Summary

The literature in the field of creativity is filled with speculation which is very probably due in part to the nebulous criteria which must be used. In general, it has been necessary to consider creativity on an ex post facto basis since to date no satisfactory means have been devised for predicting creativity in the individual prior to its occurrence. Many of the descriptions are based on behavior of the person who has demonstrated himself to be creative and this behavior is accumulated in retrospect. Certain opinions occur over and over again in the literature. One of these is the speculation that creativity should not be based upon the usefulness of the product. We should not use completely empirical tests of creativity since empirical tests are based upon past knowledge and would militate against a recognition of original production. It is stated that creativity represents the infusion of a new dimension of meaningfulness into a problem or situation and a breakthrough of past perceptual limitations.

The necessary conditions seem to be that creativity represents an awareness of problem situations, an ability to concentrate upon these situations, and the ability to accept or welcome the tension of an unsolved problem.

B. Specific Studies

Northrup (10, page 198) states that no one creates unless he is disturbed by something. Creative thinking consists of being sensitive to this type of disturbance, in staying with the problem which is disturbing and finally

producing an answer which might possibly be confirmed by experimental evidence.

Ferren (10, page 199) describes a creation as a successful step into the unknown.

Hopkins (6, page 229) states from the framework of education that all persons create at some level or at least have the potential to create.

Lowenfeld (9, page 538) maintains that there is a common core of creativeness so that creativeness in arts has some common attributes with creativeness in the sciences.

Strang in an article entitled "Developing Creative Powers of Gifted Children" (16, page 20) stated that creativity may take many forms in many fields. As examples given, the first grade child may think of using the transparent paper from a candy box as a window pane for his cardboard house. Other kinds of creativity may be shown later by the child who discovers a new and simpler way of solving arithmetic problems, by the junior high school pupil who writes an original play, or by the senior high school pupil who wins the science award for unique projects.

Ghiselin (12, page 6) states that creativity must be distinguished from inventiveness and resourcefulness. In resourcefulness he feels that little thinking is required to reach a solution but rather the intelligent use of previous experience and knowledge. He states that there are two levels of creativity. The higher level "alters the universe of meaning by introducing into it some new element of meaning or some new order of significance." The lower level of creative action "gives further development to an established body of meaning through initiating some advance in its use." He feels also that creative production must be purposive and not a result of

random processes of trial and error.

Arthur Koestler in a newspaper article (San Diego Union, February 5, 1961) written at the University of California Medical Center in San Francisco states that intellectual creativity partakes of the basic ingredients of both laughter and tears. He describes this process further as being that of perception of one thing in two different contexts. As an example he points out that a pun is a single sound which has two meanings. Thus he feels that a scientific discovery may originate from seeing an old idea in a new context. The breakthrough then is one of superseding the old limitations. He describes the order of creativity as that of a creative worker working on a problem to the point where the elements are much like elements of old problems but with new rules. The worker has blocked at this point which creates a frustration and this frustration causes his thought to assume a circularity with many random trials as solutions. Thus, the whole personality of the person becomes saturated with the problem with accompanying tension. Eventually, to overcome this tension he may be able to see the situation in a completely new frame of reference. Direction, according to Koestler, is only vaguely sensed and he gives as an example "Something reminds me of something but I don't know what reminds me of what and why."

Fromm (2, page 93) states that creativity is the ability to see and to respond. He continues that there are two conditions of the creative attitude. One requires the capacity to be puzzled and the other the ability to concentrate. A third condition of creativeness, according to Fromm, is the ability to accept conflict and tension rather than to avoid them.

III. CHARACTERISTICS AND AGE RANGE OF CREATORS

A. General Summary

It appears that the people who can be designated definitely as creative have

been fairly young. An example is that Nobel prize winners have ranged in age from 23 to 51 with their average age being 36. Characteristics listed one or more times by various writers for creative perople are as follows:

(1) They are self-starting.

(2) They have been able to work in a free situation unfettered by artificial limitations.

(3) There has been a value placed on the work they did.

(4) They are competitive.

(5) They are sensitive.

(6) They are aware of problems.

(7) They have an ability to concentrate upon problems.

(8) They are flexible in their thinking.

(9) They are spontaneous in their expressions of ideas.

(10) They have a high degree of ability to abstract.

(11) They have a high level of motivation toward the problem.

(12) They possess rugged mental health which tolerates frustration.

(13) They appear to be at home with disorder and complexity.

(14) They have a high order of intelligence.

(15) They dislike routine.

(16) They have a distaste for interpersonal relations.

A number of these traits have been verified by factor analytic studies.

It will be seen, in general, that these creative people tend to be young and they tend to violate many of the ordinary concepts of "good adjustment" particularly in their distaste for interpersonal relations.

B. Specific Studies

Conant and Strang (16, page 21) list the characteristics of the creative person as follows:

(1) Sensitive perception of details in the world of nature and of man.

(2) Awareness of and concern about unsolved problems.

(3) Fluency of thought.

(4) Concentration.

(5) Integration.

(6) Flexibility and spontaneity guided by a goal or purpose.

(7) Originality and individuality.

(8) Ability to analyze, abstract, and synthesize.

(9) Ability to go beyond the facts and discern new implications.

(10) Keen satisfaction in creative activities.

(11) Auditory imagery as vivid as tonal perception in the case of composers.

(12) Superior abstract and verbal intelligence.

(13) Motivation character traits and emotional factors.

(14) Rugged mental health and stability in order to achieve the necessary concentration, perseverance, and adherence to high values.

Barron (3, pages 151-160) reports a study to determine characteristcs of creative individuals. In general, he found that the creative are more at home with disorder and complexity.

Tettel (15, page 92) cites a comparison of highly selected architects, writers, and mathematicians from the Terman's gifted child sample now grown older. They were tested with the Terman Concept Mastery Test and evidence showed that the creative individuals scored higher than the sample in general. He stated further (15, page 79) that he was inclined to see the general evidence as agreeing with Terman that emotional stability may be low for literary geniuses but that the average level of ego strength and emotional stability is distinctly higher for effective scientific researchers than for the general population.

McClelland (15, page 229) from an analysis of the Strong Vocational Inventory scores of a group of scientists lists their attributes as follows:

(1) A dislike of interpersonal relations.

(2) Fondness for mental manipulation of things rather than people.

(3) A liking for method and exactness.

(4) A liking for autonomy.

(5) A dislike of sterile or monotonous routine.

(6) A dislike of introversive and affect associated preoccupations such as poetry.

(7) A certain interest in the problem of taking a wager or gambling. He clarifies this by indicating that this is similar to the general pitting oneself against an uncertain situation.

(8) A preference for the mechanisms of repression and isolation in dealing with instinctual energies and emotions.

(9) A distaste for interpersonal controversy in any form.

(10) Low oedipal intensity explained as a low tendency to rebel against the parent of like sex and a weak tendency to cathect the parent of opposite sex.

(11) Strong perseveration and strong control of impulses.

(12) A Liking for the world of things and objects.

(13) Low talkativeness.

(14) Low impulsiveness.

(15) Low gregariousness.

(16) A liking for abstract thinking.

(17) Not especially driven by status aspirations.

(18) A high tolerance of ambiguity.

A study of industrial research chemists by Stein (13, page 178 and 179) reports a number of characteristics as follows:

(1) Parents of more creative subjects did not go as far educationally as parents of the lesser creative subjects.

(2) Socio-economic status of the parents of the more creative subjects was not as high as the lesser creative subjects.

(3) Geographical area seemed irrelevant. Creative subjects say they were more distant from parents and adults in general, more tendencies to engage in solitary activities early in life.

(4) More autonomous individuals who tend to see themselves as different from their colleagues.

(5) Attitudes that suggest the striving for more distant goals.

(6) More integrative attitudes.

(7) More cautious and realistic.

(8) More consistent in desires for rewards.

(9) A more differentiated value hierarchy.

(10) Regard themselves as assertive, authoritative and as possessing

leadership ability.

Cattell (12, page 377) cites the results of an analysis of 250 men noteworthy for a new accomplishment in American science. These were analyzed by field of activity. The youngest group was composed of mathematicians, who averaged 36.1 years of age, with the oldest being the geologists, who averaged 49.4 years at the time recognition was achieved. The average age of the total group was 42.9 years.

Guilford (2, page 145) has done much work in the factor analysis of creative performances. He gives various factors which have been isolated from his work. One of these is a generalized sensitivity to problems. Still others were fluency of thinking, verbal fluency, associational fluency, expressional fluency, ideational fluency, all being similar but isolable by factor analysis. In the area of flexibility he has isolated several factors called spontaneous flexibility and adaptive flexibility. Certain traits of originality were indicated by measurements of unusualness of response, by remoteness of association or relationship, and by variety of responses given which are judged as being clever.

From his data Guilford states that the original person tends to be more confident and tolerant of ambiguity and to like reflective and divergent thinking and aesthetic expression; whereas, the unoriginal person is inclined to be more meticulous and to feel the need for discipline. However, he states that there is no indication that the original person is necessarily less inclined toward cultural conformity, including moral aspects.

IV. RESEARCH ON CULTIVATION OF CREATIVITY

A. General Summary

There has been very little work done in this area which would be considered to be rigorous research. Some work has been done with a variety of tests and some with interview techniques. There has been an occasional evaluation

of brain-storming as beneficial.

From the research cited, certain principles seem to emerge. These are as follows:

(1) There may be an organic difference in the creative person.

(2) For creativity an atmosphere free of external interference is necessary.

(3) Attitudes of creativity can be improved by training in problem solving. To this one might add parenthetically that the attitudes may not be created by this training but only improved if present.

(4) Intelligence quotient alone may be insufficient to identify the creative person although the criterion problem is difficult. The difficulty arises here in that there has been a tendency to define the person who deviates from the norm as possibly creative; whereas, this may not necessarily be so.

(5) Better solutions to problem situations emerge under less pressure.

(6) Nonconformists in the intellectual sense tend to be better problem solvers.

In looking over the evidence cited, there seems to be a general suggestion of an innateness of creativity which can be improved by favorable conditions but which will not be produced by these conditions.

B. Specific Studies

Guilford (1, page 434) from his work in the measurement of creativity and other factors has described 40 factors related to the structure of the intellect which he arranges in a three dimensional mathematical model on the axes of figural, structural, and conceptual dimensions. He has done much work with his associates (1, page 435) in attempting to devise objective tests to measure originality. Three dimensions of originality have

been described operationally as being uncommonness of response, remoteness, and cleverness. Following this approach, Wilson and others (1, page 435) isolated from tests 14 factors of creative thinking. Among these were verbal comprehension, numerical facility, perceptual speed, visualization, general reasoning, sensitivity to problems, word fluency, associational fluency, ideational fluency, adaptive flexibility, spontaneous flexibility, originality, closure, and judgment.

An attempt was made by Springbett and others (1, page 435) to devise a test measuring the interaction between the unconscious and conscious processes. They followed the hypothesis that creative thinking involves a greater communication of unconscious processes. They felt that their results confirmed this hypothesis.

Getzels and Jackson (1, page 435) report a multidivisional approach predicting achievement in the classroom. They compared members of a "highly intelligent" group who were in the top 20% on I.Q. scores but not on measures of creativity with a "highly creative" group who were in the top 20% on measures of creativity but not on I.Q. scores. They used a number of test instruments adapted from Guilford's test batteries as well as stories and other material. They report their findings as follows:

(1) Despite a difference of 23 points between mean I.Q.'s the groups were equally superior in achievement.

(2) The teachers liked the high I.Q. children in class.

(3) The creative group rated such aspects of personal aspiration as marks, I.Q., pep and energy, character, etc., lower than did the high I.Q. group. The creative group rated wide range of interests, emotional stability and sense of humor higher than did the high I.Q. group.

(4) The high I.Q. group wanted those qualities that would lead to success; whereas, the creative group did not express ambitions in terms of success.

(5) Personal aspirations of the high I.Q. group were those that they thought teachers would approve.

(6) Creative students exhibited more imagination and originality in the story material.

These investigators feel there is a need to expand the concept of giftedness as creative youngsters may escape identification by teachers or by conventional I.Q. measures.

In an investigation of creative behavior in 5th and 6th grade pupils, Ferris (1, page 436) used interviews with teachers as an investigating device. No direct positive relationship was found between high intelligence and creativity. The creative children were described as having a sense of humor and being self-confident and skilled in human relationships. It was concluded only that creativity may be a generalized ability or may be specific only to certain areas.

Using faculty ratings of graduate and advanced undergraduate students as well as a battery of tests of mental abilities and personality, Drevdahl (1, page 436) reported that creative persons are superior to the noncreative in verbal fluency, flexibility and originality. Creative artists were described in this investigation as being more radical and self-sufficient than either creative scientists or noncreative persons. Individuality or nonconformity appeared to be desirable for creativity.

Osborn (1, page 436) discussed brain-storming and its implications for creative thinking. He gives the four basic rules of brain-storming as follows:

(1) Criticism is ruled out.

(2) "Free wheeling" is welcomed.

(3) Quantity is wanted.

(4) Combination and improvement are sought.

It is assumed in brain-storming that group activity promotes production of creative ideas.

Taylor, Berry and Block (1, page 437), using college students as subjects, found that group participation appears to inhibit creative thinking. To account for this inhibition, they hypothesized that an individual working in a group feels subject to criticism even though this may not be expressed. Another tentative explanation is that people working in a group may perseverate on the same ideational set where an individual working alone may have a variety of sets, and hence an abundance of ideas.

Ghiselin (1, page 437) assembled descriptions of creative products of prominent artists, writers, philosophers and scientists and pointed out the difficulties in detecting creative talent and in recognizing the creative impulse. The creative process is believed to be related to organic development and the end of the creative process "is not whatever solid or silly issue the ego or accident may decree, but some specific order urged upon the mind by something inherent in its own vital condition of being and perception, yet nowhere in view."

Rogers (1, page 437) presents a theoretical framework on creativity and asserts that the mainspring of creativity is man's tendency to actualize himself. He feels that the atmosphere for creativity must maintain the integrity of the individual and should be free of external evaluation.

A study of classroom practices (7, page 101) emphasizes the desirability

of treating pupils as individuals and, to show present practices, analyzes time spent in 318 classrooms in 14 school systems in western Pennsylvania. This analysis shows that 64% of the time the class was taught by one textbook or by one workbook, 4% of the time the class was taught by pupil-selected projects, 43% of the time the teacher dominated all activity, 5% of the time was pupil initiated, 34% of the time all of the pupils were doing identical work with no individual assistance, and only in 4% of the time was the work differentiated for the individual. It was felt that clearly here there was no opportunity for development of initiative.

An investigation of development of creative productivity was carried out by Ponds and Meadow (15, pages 187-200). A semester course was given in creative problem solving which utilized the principle of brain-storming. It was concluded that the course resulted in significant increments on the measures of quantity of ideas and of quality of ideas. In testing for these factors a year after taking the course, the increases remained evident. These investigators believed that more good quality ideas were produced by individuals under brain-storming instructions than under other conditions. Those trained in the technique of brain-storming produced more good quality ideas in this technique than did the untrained group. Groups utilizing the brain-storming principle were also more productive of good quality ideas than the same number of individuals working independently under conventional methods.

Torrence (15, page 65) found that in one school of 150 pupils, using the Wechsler Intelligence Scale for Children as a measure of intelligence, 70% of the 20% most creative would have been excluded. Results were essentially similar in another setting using the Otis Quick Scoring Test of Intelligence. In this study it was stated that the high I.Q. pupils tended to be better

known by their teachers and be considered more desirable as pupils. The high I.Q. lower creative pupils tended to be more highly preferred by teachers than those that were high on both factors. Those high on both were judged more friendly and more studious and hard working than either of the other two groups. The high creatives in the lower grades were more isolated and under more pressure from their peers than were those in the intermediate grades. There is apparently a great pressure for conformity in the primary grades.

Stein (12, page 402) reports a study of problem solving with the variables being group size and the amount of threat present in the situation. The subjects for this study were college students. He concluded that under threat conditions, the number of good solutions produced increased as a negatively accelerated function of size of group. Quantity and quality of solutions were greater under conditions of reduced threat.

Hilgard (2, page 169) stated that the importance of personality variables in problem solving was very prominent in the Stanford studies. In these studies there appeared a sex difference favoring men, and from this it was concluded that some social process concerned with identification with the male role makes for better problem solving. Nonconformants in a group pressure situation were the better problem solvers in these experiments. Hilgard stated further that in experimentation regarding group versus individual work the results are about evenly divided. The group does better than the individual but has not really increased efficiency over a number of individuals working separately and pooling their findings.

Hilgard (2, page 178) also expresses the fear that wrong methods of instruction may destroy the inquiring attitude and quench the spark of creativity. Along this line he cites a study that shows a higher degree of college success

for boys and girls who had had only three years of high school than those who had had four. It is suggested that there may be some defect in procedure in the last year of high or in the first year of college.

V. OPINIONS ON THE CULTIVATION OF CREATIVITY

A. General Summary

Opinions are much more plentiful in the literature in this field than are actual research data although they tend to follow the same lines. This may be in part because research has been sponsored, in the main, by those attempting to verify particular hypotheses. Certain factors again emerge as opinions of various authorities. Among these are the desirability of favorable environment, which will include appropriate assistance, leadership which will aid in problem recognition, and opportunities and materials which will aid in problem recognition, and opportunities and materials which will be available.

There has been much speculation about the intrinsic drive which would be allied to the organic factors previously mentioned. Under this heading would certainly be included the insight phenomenon exhibited by many creative people. Conditions which should be met in the opinion of many are as follows:

(1) External evaluation should be absent and the atmosphere should be noncritical and encouraging.

(2) Teachers should be selected who are not defensive.

(3) There should be a necessary background of learned skills.

(4) There should be adequate time to pursue ideas.

(5) Conformity in behavior should not be confused with conformity in thought.

(6) Educational techniques should not emphasize convergence of ideas and "correctness."

(7) There should be a prelude of immersion in subject matter.

(8) There should be an atmosphere of acceptance and stimulation.

It appears in general that analysis of the creative process follows the classic divisions of:

(1) Preparation

(2) Incubation

(3) Illumination

(4) Verification

Personality factors have been stressed by many and it appears that in the opinion of these writers there are a number of points of deviance in the creative person. Frequently listed are such factors as:

(1) Dependency

(2) Defiance of authority

(3) Immaturity

(4) Sense of omnipotence

(5) Gullibility, at least outside a given area of specialization.

One factor which is stressed over and over is the need for time in an instructional program for special, perhaps even idiosyncratic, interests.

Returning to the classic analysis of problem solving behavior, it appears that the schools might be most helpful in the area of preparation in that they are able to furnish the potentially creative person with the necessary background of relevant material and in the area of verification where methods for empirical and experimental verification may be taught.

Development of creativity must be considered as the end objective of educational programs for gifted. It should be clearly recognized that creativity and the fostering of it influences content of curriculum, grouping, instructional methodology, and administrative procedures.

B. Specific Writings

The N.E.A. Summary of Research on the Academically Talented (1, page 437) emphasizes the importance of investigation of creativity. It is stated that the process necessary to stimulate the creative act continues to remain nebulous. Dr. Conant has emphasized the importance of favorable surroundings and good leadership, and of a lack of inhibition in thinking.

An article in the Journal of Educational Leadership (6, page 229) states that the classroom environment can help the child create. This environment consists of many visible things and many which are not. The classroom may be organized, as many are, on a dual or traditional theory of learning which blocks or suppresses internal meanings for the child. It is felt that the classroom has to change from an authoritarian to a cooperative field. The atmosphere should be one of belongingness, security, and status. It is felt that the teacher must help the group remove fears and threats as well as external demands from authoritarian sources. Children must study their own needs in their own groups by their own creative processes, according to these articles. Each child must be free to create the new meanings necessary so that he may emerge as an individual. The attitude of the educator should be to recognize that all persons can create at some level and to furnish a classroom climate in which creativeness can be released, accepted, respected, and guided.

An article entitled "Our Obligation to the Creative Child" (11, page 205) states that the education system has the obligation to single out those of the oncoming generation who possess qualities of mind and personality that render them distinctively different from their fellows. This article states that the overwhelming majority absorb and accept the knowledge, ways, outlook and dominant value systems of the culture. The smaller element is

composed of those who possess inventive genius, critical acumen, or creative ability or insights. Educational programs have tended to gear themselves to mass needs and abilities of the first group. The classroom experience has consisted mainly of "following orders" and working from a set pattern of rules with a fixed body of knowledge. Often orthodox education has penalized the original or gifted child for his creative qualities because he did not fit into rigid molds of tradition. The writer of this article feels that the child expressing an original idea or talent should be encouraged. It is stated that just as there are teachers who cannot forgive themselves for their lack of creativity and so compensate by condemning the artistic endeavors of more productive individuals so there are occasionally instructors who subconsciously or consciously resent creative talent in the young.

Strang (16, page 20) states several measures which would tend to develop creativity. These are as follows:

(1) Provide general conditions or an atmosphere conducive to creativity.

(2) Offer opportunities and materials for exploration.

(3) Build a background of knowledge and skill.

(4) Give examinations that call for creativity.

(5) Encourage and reinforce creativity as it appears.

Hildreth (8), as cited by a local review of literature, feels that the key to releasing creative ability is found in freeing the child from formal program requirements and furnishing him with time, space, materials, and encouragement. Written composition is felt to be one of the best media for expression of creative ideas, since it requires no formal equipment and is useful throughout a lifetime. At the Hunter College Elementary School much

emphasis is given to a program featuring instruction in art, work in language and literature, writing and producing plays, working on school publications, making class reports, reviewing books, writing stories and articles, preparing editorials for the school papers and participating in assemblies.

Gershinowitz (5, page 5) quotes Greenewalt in saying that conformity in behavior is a human necessity but conformity in patterns of human thought is a human danger and that in modern times there has been a tendency to mistake one for the other. He further states the hope that our educational processes can be flexible enough to tolerate the inquisitive, skeptical, and often rebellious student. We do not know whether creative abilities can be developed as yet but we do know that they can be aborted or stifled.

Conant (16, page 18) states that exceptions certainly can be made for those highly gifted in art, music, or academic work. These children should be given the kind of fare in the high school years which will at least not block their creative powers. However, it is important in his thinking to recognize the danger that a child or parent might use a gift outside the academic area to dodge an academic requirement.

Strang (16, page 41) discusses the characteristics of creative teaching. The teacher who has a creative attitude toward his work will vary his method of teaching. He will encourage or stimulate youngsters to venture into unknown areas. He will give creative types of examinations and will reward creative responses.

Guilford (15, pages 56-57) discusses the performance of creative adolescents and feels that the essence of their creativity lies in their ability to produce new forms, to risk conjoining elements that are customarily thought of as independent and dissimilar, and to "go off in new directions."

Creative adolescents seem to be able to free themselves from the usual and to diverge from the customary. They seem to enjoy the risk and uncertainty of the unknown. In contrast, agreeing with the Getzels and Jackson data previously cited, he speculates that the high I.Q. adolescent seems to possess to a high degree the ability and need to focus on the usual and customary and to shy away from risk and uncertainty of the unknown. He feels that education has emphasized abilities in the areas of convergent thinking and evaluation.

It is reported by the Portland, Oregon Public Schools (13, page 14) that they are making use of special junior-senior high seminar classes of eight to 15 students in the fields of mathematics, science, literature and social science. Content of these classes develops from teacher and student interests and is not predetermined. Members of the Reed College faculty serve as consultants and resource people in subject matter. The Portland schools also use a special class method in the high schools where the seminar method is employed but the class is essentially a small section in a regular subject. Freedom is not as great in these classes.

Laura Zirbes (17, page 24) feels that creativity is a general potentiality which needs to be encouraged, fostered and developed. She feels that public education should concern itself with furnishing conditions that favor fulfillment of creative potentialities. To her this implies a continuous concern for the avoidance of stultifying processes. She feels it is possible to recognize and designate uncreative qualities of teaching and that it is also possible to set curricular expectations with the end of eliminating these uncreative components. She gives a list of objectives which she feels should be striven for. These are as follows:

(1) Moving from stereotyped conformity toward free expression.

(2) From passive compliance toward active identification.

(3) From imposed direction toward cooperative planning.

(4) From coercive requirements to voluntary commitments.

(5) From mass handling toward individuated guidance.

(6) From extrinsic motivation toward value concern.

(7) From submissive acquiescence toward wholehearted involvement.

(8) From restrictive domination toward responsible self-direction.

(9) From stultifying repression toward spontaneity.

(10) From the fixing of habits and skills toward the cultivation of flexible, adaptive responses.

Flanagan (14, page 123) gives a list of characteristics of creative people as follows:

(1) They are more observant and value accurate observation and truth telling to themselves.

(2) They often tell or express part truths, but vividly.

(3) They see things as others do but also as others do not.

(4) They are independent in their cognition and value clear cognition.

(5) They are motivated toward independent, sharp observation because of their own ego structure.

(6) They are born with the capacity to hold many ideas in their head and to compare and manipulate these ideas.

(7) They are constitutionally more vigorous and more sensitive.

(8) Their universe and their lives are more complex.

(9) They have more apperception of unconscious motives and fantasy, as well as their own impulses.

(10) They have exceptionally strong egos, being able to tolerate

variability in themselves and the environment more than the average person.

(11) They have greater tolerance of insecurity.

(12) They are organisms of more freedom since they can allow themselves greater variability.

Schwartz (12, page 406) is concerned with the part the teacher plays or can play in encouraging creative imagination. He divides imagination into duplicative, which is the same as memory, and constructive or creative, which involves recombination of elements from previous experience. He suggests training in perception, problem solving, judgment, and studying in order to develop creative imagination.

In an article on scientific creativity, Eyring (2, page 4) states that the gifted individual requires a stimulating environment, including freedom from distractions and freedom from authoritarian society. He profits from congenial surroundings and stimulating company. He needs to be at peace with other issues except for the conflict characterizing his immediate problem. Eyring feels that while the lone wolf has solved many problems an increasing number of scientific enterprises are highly cooperative and require social interaction. Thus, personality which is congenial to others is increasingly important. He also cites the success of the G. N. Lewis School at Berkeley in turning out outstanding physical chemists. In this school the entire emphasis is on research to the exclusion of course work.

Sinnott (2, page 23) discusses two major methods operative in creativity. One of these is primarily a deductive creativeness, which consists in marshalling the widest possible array of facts and ideas and in searching for unrecognized relationships. He believes that this is the method used by Edison and by Einstein. Other inspirations, however, seldom come unless

an individual has immersed himself in a subject. He needs a rich background of knowledge and experience.

Anderson (2, page 141) feels that more than simply an open system is necessary to produce creativity. There must be stimulation and interaction with the environment. In an article on the role of education in the fostering of creativity, Weisskopf (12, page 410) feels that "mental attitude during intellectual work encouraged by our schools is in many respects diametrically opposed to the mental attitude which is thought to stimulate creativity." He feels that schools emphasize constant industry and do not allow the leisure that encourages creation. Regular study habits are emphasized at the cost of initiative. A critical attitude toward intellectual affairs is promoted which does not permit unrestricted creative expression of ideas. One-sidedness is discouraged as "immature" with a resultant scholarly insight but a loss of the creative impulse. It is agreed that industry, regular study habits, and a controlled attitude are necessary for preparation of intellectual work but felt that these provide training only for the first and last stages of the creative process--preparation and verification. This approach neglects the importance of the incubation and illumination stages.

Guilford (2, page 159) discusses methods which have been used in attempting to increase creativity. He feels that the brain-storming method still remains to be proved. Other studies with children suggest that attempts to train creativity may result in improvements in quantity of response at the expense of quality.

In searching for criteria of creativity, Hilgard (2, page 179) suggests a list of questions which may be asked in analyzing an educational program. These are as follows:

(1) Does the student initiate inquiry on his own or only inquire along lines set by others?

(2) Is there opportunity to exhibit and take responsibility for successive evidences of creativity even though the individual items are not "distinguished?"

(3) Are there opportunities for the student's original work to be judged according to the individual progress rather than group norms?

(4) Is there time in the program for a substantial investment of time in idiosyncratic specialization?

(5) Is there evidence that the progressive changes during the academic year are toward greater diversity of talent rather than toward greater conformity?

Stoddard (2, page 188) feels that it is probable that creativity can only be fostered with reform in teaching methods and grade organization. He feels that the typical classroom teacher is swamped with chores. He is supposed to act as a tutor even with 30 pupils in the classroom but he does not really know the pupils' minds. Technical aids are regarded as luxuries. The culture has been willing to spend millions of dollars on kitchen equipment in order to free the homemaker but to free the teacher is regarded as somehow sinful. He advocates team teaching plans by special teachers in music, art, science, and mathematics. This plan would allow pupils in grades one through six to remain with homeroom teachers for the half-day devoted toreading, writing, speech, and social studies. The rest of the day they are under special teachers in mathematics, science, music, arts and crafts, recreation and health. These teachers work as a team responsible for instruction through the grades. Thus the special teaching plan is

organized on a longitudinal basis, which groups the child according to needs rather than on an age-grade distribution. Homeroom and special teachers need to gather regularly to discuss problems of instruction. He feels that this plan results in a resolution of four forces--the child, the teacher, the school, and the culture pattern. Children are not equally creative in all disciplines and they vary enormously in intelligence. They must be encouraged to make progress in the arts of communication and ordinary living. Flexibility of this plan allows for individual differences to a greater extent than the usual methods.

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